$BR.a=c^2$, $AP.a=AR.a=bc$, $BP.a=a^2-b^2$, $CR.a=a^2-c^2$, *i. e.*, $PR.a=2bc\cos A$; (4) hence BA touches circle ARC, which contains a Brocard-point of ABC; similarly for CA and circle APB; (5) $BR.CR'$, $AR''=abc=CP.BP'$, AP'' (where R', R'', P', P'' correspond to R, P, on CA, AB, respectively); K, K' are the Brocard constants ($k=a^2+b^2+c^2$) of ABC, $A'B'C'$: then $K'-K=\triangle^2/R^2$.

181. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy, Ohio University, Athens, Ohio.

Prove that the extremities of the latera recta of all ellipses having a given major axis $2a$ lie on the parabola $x^2=-a(y-a)$.

CALCULUS.

142. Proposed by J. SCHEFFER, A. M., Hagerstown, Md.

Solve the differential equation,

$$(a-x)\frac{dz}{dx}+(b-y)\frac{dz}{dy}=c-z.$$

143. Proposed by L. C. WALKER, A. M., Petaluma High School, Petaluma, Cal.

Find the area of greatest ellipse that can be inscribed in a given semicircle.

144. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Find the volume of the sphere, $x^2+y^2+z^2=2az$, (a) within the paraboloid $z=Ax^2+By^2$; (b) within the cone $z^2=Ax^2+By^2$.

MECHANICS.

134. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

If $pv=Rt-b/tv$ be the equation for CO_2 gas, find the total, external and internal work done in compressing the gas from 102 to 136 atmospheres at a constant temperature 17°C and constant volume, $R=63.23$, $b=481600$ for CO_2.

135. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College Defiance, Ohio.

What force acting *at an inclination* ω with a horizontal line on the center of a wheel of given weight will *roll* the wheel over an immovable cylindric log whose diameter is $(1/m)$th that of the wheel?

DIOPHANTINE ANALYSIS.

91. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

There are two unequal squara numbers the sum of whose sum, difference, product, and quotient, is a square. Find the two numbers.